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ABSTRACT

A study of four unusually competent high school writers was undertaken to determine the reasons for varying durations of pause in writing. It was believed that a writer pauses during transcribing to rehearse, plan, and reformulate and to make a number of crucial decisions about syntax, semantics, and discourse. Each student spent a total of 12 sessions writing on topics which he or she had selected from 12 tasks in four different discourse types during the previous session. After the first three practice sessions, the final session was spent in handcopying a finished manuscript, writing in a room in which both the writer and the writing pad were videotaped. The signal from the camera on the writer was also passed through a time-date generator which recorded time in minutes, seconds, and tenths of seconds. The videotapes were analyzed for time of pause and calculated to a tenth of a second. It was discovered that the time of pause varied according to the type of writing being attempted with significantly shorter pauses when the writer was merely copying. It can be concluded that pause is necessary in writing to help the writer organize his or her thoughts before committing them to paper. (JF)

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A Video Time-Monitored Observational Study: The Transcribing Behavior and Composing Processes of a Competent High School Writer*

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Introduction

We have elaborate schemes for describing and analyzing written texts, from which we make inferences about how texts are produced. We have volumes of writers' introspective commentary, from which we learn how they experienced the process of composing and what they claim to know about it. We have case study accounts of the composing process, from which we have developed general stages in that process (conception, incubation, and production or pre-writing, planning, writing, revising, and editing). In addition, we have theoretical models for how individuals read, respond to, or process texts, from which we have learned a great deal recently about the activity of reading.

Yet we still do not have a way to describe precisely how the mind works to compose a piece of written discourse. What we need, and are still searching for, is a window to this opaque, psycholinguistic language activity which we call composing in writing.

Our search for a solution to the complex research problems of studying the

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process of composing in writing led us to translate the metaphor "window" quite literally to a videocamera lens and the qualifier "precisely" to a clock. Videotaping and timing the transcribing behaviors[1] of each of our four writers composing in several discourse types, we obtained a fascinating visual record. This videotape record, along with transcripts of each piece of writing and of taperecorded interviews, will provide the data for a temporal study of the composing process. Our study will focus on pauses in transcribing. Our basic unit of analysis will be pause time in tenths of seconds.

Our hunch is that a writer pauses during transcribing to rehearse, plan, and reformulate and to make a number of crucial decisions about syntax, semantics, and discourse. We will be looking for pauses of relatively long duration that reoccur in specific locations. And we will be asking the following two questions:

First: From an analysis of the location and duration of pauses, what can we infer about one writer's process of composing?

Second: Will the results of this analysis differ when an individual composes for different discourse purposes? If so, what can we learn about that individual's composing process for different discourse purposes?

This unlikely research plan (and even more unusual technology) comes from two sources: (1) research in our own field of English Education, which emphasizes the process of composing in writing and (2) research in the field of psycholinguistics, where interesting work is being done on composing in speech. Although many researchers in our own field have observed the curious part that pauses play in composing and transcribing (Britton, 1975; Burgess, 1973), and others have even suggested a study such as this one (Emig, 1971; Britton, 1975; Odell, Cooper and Courts, in press),

[1]By transcribing, we mean only the observable, physical act of writing down words. By composing, we are referring to the cognitive, psycholinguistic activity of formulating and communicating ideas and experiences through written discourse.

it was not until we discovered Frieda Goldman-Eisler's study of pauses in spontaneous speech that we were finally able to conceptualize and plan the present study.

Because our present research follows Goldman-Eisler's research on the temporal aspects of speech production, it seems useful to begin with a review of her work. Next, we will describe our rationale for choosing to study the pause in transcribing. After a brief description of the design of our study and our videotaping arrangements, we will present some initial findings from an exploratory sally into the data. Even though we are still searching for ways to handle the major portion of the analysis, we are confident we will learn some interesting and useful things about how people compose in writing.

Related Research in Composing in Speech

Frieda Goldman-Eisler's extensive research into temporal patterns of the pause in spontaneous speech has demonstrated that hesitation pauses (pauses longer than .25 seconds), when studied in their clausal or sentential contexts, function as an index to cognitive activities necessary to composing spontaneously in speech. Goldman-Eisler assumed that observable speech phenomena are accompanied by a mechanism of 'internal time' that controls planning and organization and that also accelerates or delays the subsequent execution of speech. Goldman-Eisler tested this assumption in a number of experimental situations. She concluded that the characteristic duration, location, and non-random distribution of hesitation pauses in spontaneous speech reflect specific cognitive processes such as memory, attention, and planning which inform the composing process of speech.

In spontaneous speech 40 to 50 percent of total utterance time is pause time (Goldman-Eisler, 1964). When Goldman-Eisler (1967) looked at the relationship of speaking time to pausing time, she found a consistent pattern of hesitation pauses. This pattern consisted of a regular alternation between long pauses followed by short speech utterances and short pauses followed by long speech utterances. From this consistent, recurring pattern Goldman-Eisler concluded that the temporal "ebb and flow" reflects the cognitive activity of planning during the long pause-short speech segments and of subsequent execution during short pause-long speech segments. She found that the time spent in each of the two alternating segments is about equal, but there must be a minimum of 30 percent pause time for these rhythmic patterns to exist.

Goldman-Eisler (1968) also explored the speaker's use of semantic information and its relationship to pause patterns. She asked her subjects to generalize about the main point of the same cartoons. She found that when individuals generalize about the main point of a cartoon, they pause for twice as long as when they describe. These results seemed to her to indicate that in generalizing an individual relies less on "vocalization of automatic learned sequences" and therefore has to pause for longer periods of time to compose spoken generalization.

Continuing this line of research, which tested her hypothesis that cognitive processes are reflected in the relative duration and location of pauses, Goldman-Eisler (1971) examined the incidence of left and right branching in clauses. The results of these studies indicated that either left or right branching, but not both occurred as a characteristic of the individual speaker, rather than a function of the language or situation. On the basis of her work in clausal embedding and information available in short and long term memory, Goldman-Eisler asserted that left branching requires more storage time in memory, since the

speaker must pre-integrate the clause prior to the execution of the sentence.

Goldman-Eisler has also studied how the rate of speech production reflects planning activity necessary for composing spontaneous speech. She compared the fluency of transition (the ratio of fluent pauses over hesitant pauses) prior to relative, subordinate, and coordinate clauses as well as the fluency of transition between sentences both in speaking spontaneously and in reading familiar material. She found that when individuals composed spontaneously in speech, transitions between relative clauses were most fluent (took the least time) and steadily decreased in fluency prior to subordinate and coordinate clauses. The least fluent transitions (took the most time) occurred between sentences. In reading, when compared to speaking spontaneously, transitions were always fluent between constituent clauses but consistently less fluent between sentences. She concluded that during spontaneous speech sentences rather than constituent clauses or words, were least fluent. This conclusion means simply that sentences had the highest percentage of hesitant pause transitions.

Goldman-Eisler's recent work (1975), "An Experimental Study of Interference between Receptive and Productive Processes Involving Speech," explores the decoding and encoding processes of simultaneous conference translators. She constructed an experimental test situation to study how listening is interfered with by speaking simultaneously, as conference translators must do. Specifically, Goldman-Eisler questioned how speaking utilized memory and attention to listen (encode) and consequently translate and decode into the target language. Radio lectures by an eminent intellectual were the input material to be decoded. Subjects were instructed to maintain high comprehension throughout and, in fact, took a short quiz following each reading. By controlling the input and substituting three types of sequential counting activities involving increasing use of cognitive

functions---counting forward, counting backward, and subtracting while counting backward---Goldman-Eisler studied how the difficulty of decoding, and how the use of pauses while counting, varied as the three encoding activities became more difficult.

The results allowed Goldman-Eisler to formulate the following analysis of cognitive activity during simultaneous translation: while encoding activity is easy, performed automatically, requiring little attention, decoding and encoding may occur almost simultaneously. Goldman-Eisler suggests that this might be the case when a translator encodes highly automatic, familiar, cliche-like sequences. As the input text increases in complexity, recoding into the target language necessitates the use of more complex cognitive processes. With a more complex situation, the translator attempts to decrease the amount of interference between decoding and encoding by segmenting the impact of the text, using pauses at the end of sentences rather than within sentences, to form decoding boundaries. Decoding and segmenting may be a simultaneous first phase, while recoding and encoding form a second phase. The simultaneity and speed with which this process occurs depends on the level of difficulty or complexity of the material being translated.

Throughout her research, Goldman-Eisler conjectured about the way the mind works while composing spontaneously in speech. She assumed that since the production of speech is not regular, but rather is punctuated by pauses of various lengths, then these pauses might indicate the presence of cognitive activity necessary to the planning and execution of spoken langauge. She conjectured that when hesitant pauses are followed by short segments of speech, pauses are being used to plan further utterances. Goldman-Eisler found that left-branching in sentences requires more storage time in memory than right branching. In addition, she conjectured

that pauses prior to certain types of constituent structures are of consistent duration--indicating various levels of cognitive complexity in the structures. In the last piece of research we reviewed, the piece concerned with the task of simultaneous conference translators, Goldman-Eisler noticed distinct differences in the translator's cognitive strategies for familiar material and their strategies for less familiar material.

Frieda Goldman-Eisler's work clearly demonstrates how a study of pause length and frequency, of the contexts of pauses, and of the rhythm created by alternating periods of hesitation and fluency can lead to compelling insights about the psycholinguistics of spontaneous speech. Naturally, we are hoping that a similar study of pauses in writing can lead to useful insights about the psycholinguistics of composing in writing. In particular, her analysis of the contexts of pauses and her conjectures about the planning function of pauses have been very helpful to us in thinking about the ways we might analyze our data. In addition, her findings that generalizing involves twice as much pausing as narrating confirmed our choice of quite varied writing tasks for our study.

A Rationale

The Pause in Temporal Studies of Transcribing and Composing in Writing

If the study of pauses helps to illuminate a mechanism of "internal time" that controls planning and organization during spontaneous speech, then it is likely that a carefully designed study of pauses during transcription might also illuminate similar aspects of composing in writing. Our rationale for choosing to study the pause in temporal rhythms of transcribing and composing is embedded somewhere between the "if" and the "then" of the preceeding statement. Before we can present our rationale, however, we must explain how we solved two initial

problems stemming from the different ways people use pauses when composing in speech and composing in writing. Next, we consider the problem of researching temporal planning. And, finally, we discuss three reasons that informed our choice of the pause as our basic unit of analysis.

Two Initial Problems

After reading and thinking about Goldman-Eisler's research, we wondered what differences there might be in the ways that individuals use the pause during speaking and writing. We realized that when people compose in spontaneous speech, they pause for two purposes: first, they use pauses to punctuate their oral presentations, allowing the listener time to attend to the message; second, they use pauses to plan or formulate a message before verbally presenting it. Thus, the pause, during speaking, plays a dual role: it contributes to the presentation of the message as well as to the formulation of that message. By contrast with spontaneous conversational speech, writing and reading are private activities. Even though we often consider an audience while composing in writing, that audience actually reads the piece of writing at a later time, after its completion, removed physically from the writer. We concluded, therefore, that pauses during transcribing serve the function of planning, but not that of punctuating or emphasizing for an audience.

Next, we asked ourselves whether pauses during transcribing might be due to fatigue, to cramped forearm and hand muscles, and to numb index finger and thumb ends. We suspected that fatigue accounted for only a small amount of time spent pausing, but in order to be certain we conducted a simple test. We asked each of our four writers to copy a typed and edited version of his or her own writing. In all cases the pauses were of short duration. For John, who we will speak about later, pauses during copying accounted for 34 percent of the total copying time.

By contrast, when John transcribed his first drafts of original pieces, pauses accounted for 47 to 53 percent of composing time. When the other three writers composed spontaneously, they paused for up to 70 percent of the total composing time. We concluded, therefore, that pauses were not primarily used to rest the hand, but to serve the function of planning.

Researching Temporal Planning

Since we are fairly confident, then, that some sort of complex, temporal planning is going on during the process of composing, we have set about searching for ways to carry out the close, descriptive work needed to unmask these complex processes.

George A. Miller (et.al. 1960), a psychologist who theorizes about human behavior, uses the concept of "Planning" to explain behavior. Specifically, Miller offers this definition: "A Plan is any hierarchical process that can control the order in which a sequence of operations is to be performed (p. 16)." Closely related to the Plan is Miller's concept of the "Image." The Image represents an individual's internal cognitive and affective gestalt. Miller encourages those interested in explaining human behavior to study the Plan in order to learn about the Image. Taking his advice, we are hoping that a study of pausing behaviors will help us to learn more about the way the mind works to compose in writing.

Miller characterizes two types of planning--spatial and temporal. Because we are looking for a way to study temporal planning in composing in writing, we took reassurance in his reminder of its importance:

> Temporal considerations are slightly more subtle, perhaps, [than spatial considerations]. If we had only a single Plan

> to consider, there might be little need to worry about time; the execution of the Plan could take whatever length of time it required. But when Plans compete, it is our time that they compete for. We must establish rules concerning priorities, rules about when a Plan can be pursued and how long before it must be dropped, either temporarily or permanently, for the execution of a more important Plan. (p. 101-102).

When we read a text or look at its left to right, up and down, graphic format, it is easy to forget the temporal rhythm by which the text was produced. When we observe a writer, it becomes obvious that the words follow one another in a linear progression (aside from the times wnen the writer stops the forward movement of transcribing to go back and revise). But the rhythm of the word's entrance onto the page is not regular. This temporal rhythm is created by pauses of various lengths. Even though the writer generates words, sentences, and paragraphs in a seemingly linear fashion, this is merely the final step of an internal, invisible, planning process. The writer is actually generating the results of the operation of several sets of rules: syntactic, semantic and pragmatic. Our hunch is that when pauses prior to the entrance of words, clauses, and sentences onto the page are relatively long, they reflect this internal process of planning. Thus, on the basis of observation alone, it seems important to ask what is happening during pauses while an individual composes in writing.

Herbert A. Simon, in his essay "The Architecture of Complexity," helped us to think about how to study complex behavior systems through the observation of hierarchic patterns. He uses the term hierarchy to refer broadly to any complex system composed of interrelated subsystems, which are related in various ways, from elementary to a superordinate relations. He examined the hierarchic

structures of social systems such as language. Both Simon and Miller suggest that choosing an elementary unit of the hierarchy will allow a scientist to study the planning behavior of an organism. Miller (et.al. 1960) reminds us that,

> Most psychologists take it for granted that a scientific account of the behavior of organisms must begin with the definitions of fixed recognizable units of behavior--something a psychologist can use as a biologist uses cells or an astronomer uses stars, or a physicist uses atoms and so on. (p. 21)

Finding an appropriate unit of analysis for studying the activity of composing in writing has been difficult. Biologists, who study the cell as a basic unit, are able to observe the hierarchic structure of this physical system directly. In designing our study we have chosen to observe the pause, periods of inactivity when the transcription stops, in hopes of learning more about the planning and formulation of written discourse.

A Rationale: The Pause in Temporal Rhythms of Transcribing and Composing

We have taken George A. Miller's advice--we will study the Plan to learn about the Image. By studying pause behaviors during transcribing, we hope to learn about the process of composing in writing. In the previous section, we reviewed what we had learned about planning and how we applied it to our specific research problem--the process of composing in writing. In this section, we will summarize why we have chosen to study pause behavior during transcribing.

(1) Because writers are often unaware of the location and duration of their pauses while transcribing, a study such as this one, based on observed pause times, will provide a consistent, non-introspective description of

each writer's temporal patterns. Recently, researchers studying the process of composing in writing have relied on introspective responses from the writer in addition to observation of general patterns of behavior (Emig, 1971; Stallard, 1975; Graves, 1975). We certainly do not mean to belittle the value of introspective responses (we have included the introspective responses of our writers in our larger study, from which this report comes), but we also know that introspective responses may not tell us what we need to know.

Recent research by Nisbett and Wilson (1977) suggests that there may be "little or no direct introspective access to higher order cognitive processes." They point out that often when a respondent appears to relate information about his or her cognitive processes, that individual is actually drawing from his or her vast, personal and private store of knowledge. Listening to what may seem to be a startlingly accurate account, we often confuse introspective awareness with direct access to higher order cognitive processes.

Thus, we have decided to use the observed pause as our basic unit of analysis, in order to learn about processes which writers are often unable to tell us about.

(2) Using the pause as our basic unit of analysis allows us to describe, in temporal terms, complete pieces of discourse. We designed this study in order to provide writing situations which approach the actual workings of the composing process: composing in a "real" context, for a specific audience, and for a distinct purpose.

Studies of timed responses to severely limited situations generate interesting information about perception, attention, and memory; however, it is difficult to extrapolate from these findings to learn about the complexities of the composing process. Ulrich Neisser, in the introduction to Cognition and Reality (1976) reminds us that we researchers must,

> ...make a greater effort to understand cognition as it occurs in the ordinary environment and in the context of natural, purposeful, activity. (p. 7).

This approach to research led us to videotape entire composing sequences. Using entire composing sequences, however, creates huge amounts of data and new research problems. Sorting, organizing and displaying the data then becomes a larger, more baffling problem. We will speak about this situation in our section on our initial findings.

(3) The times of pauses, alone, do not reveal anything about how the mind works to compose in writing. Their use, however, is in the fact that pause times are a simple, numerical descriptor of a behavior or non-behavior (inactivity) during transcribing writing. This numerical representation of pauses permits us to describe the temporal rhythm of transcribing and then to locate patterns of relatively long pauses in specific contexts. We will be able to use these patterns to test current descriptions of written texts and theories of how these texts were produced.

For instance, let's assume, as Goldman-Eisler did for speech, that left-embedded structures require more planning time because the speaker (or writer) must pre-integrate the clause prior to the execution of the sentence. In an initial, hand-calculated temporal description of John's (one of our four writer's) reporting and generalizing, we found that the mean for hesitant pauses (pauses longer than one second) prior to T-units containing left-embedded structures in John's reporting was higher than the overall T-unit mean. This was not the case for generalizing. We also determined that John composes reporting by planning from assertion to assertion but that he composes generalizing by planning paragraph by paragraph (see our section on Initial Findings for a more thorough explanation of these conclusions). It is possible, then, that in reporting

John spends more time to plan for left-embedded structures as he plans each assertion. On the other hand, it is possible that in generalizing John spends more time planning to establish a logical structure for a whole set of assertions combined into one paragraph.

Thus, we have used the pause as our basic unit of analysis to describe one kind of transcribing behavior in simple numerical terms to detect patterns of long pauses in specific locations and finally to infer about how the mind works to compose in writing.

We have chosen the pause as our basic unit of analysis because it provides a consistent, non-introspective, numerical basis for describing the transcribing of whole pieces of discourse. If we accept the pause as our unit of analysis; if we assume that a writer functions according to some sort of plan, molded by a writer's personal gestalt and by the demands of the environment; and if transcribing is merely an easily-mastered motor skill--then might not pauses indicate periods of cognitive activity during apparent motor inactivity?

This question and its assumptions led us to pursue this study. The next section describes the design we have chosen for this study.

Design of This Study

The design of this study combines case-study procedures with recorded, timed observations of transcribing behaviors in order to elicit a multi-faceted data base from which to explore questions about the temporal nature of transcribing behaviors and about the nature of the composing process. A more detailed description of the design can be found in our report, "Learning about Transcribing and Composing Through Timed Videotape Studies" (ED 141-804), presented at the 1977 annual meeting of the American Educational Research Association in New York.

Subjects

From a suburban high school in Williamsville, New York, we identified, with the help of the English staff, about fifty unusually competent writers in Grades 10 through 12. We explained our study to this group, and thirty students said that they would like to participate. During interviews with these thirty students we chose four who regularly engaged in self-sponsored, out-of-school writing and who seemed unusually insightful about the composing process. We paid these four subjects $25.00 each to participate in the study.

Since we are not concerned in this initial study with variability in the quality of writing performance, we are choosing only unusually skillful writers, who can adjust easily to the laboratory situation. We are studying the temporal features of transcribing by skillful, mature school-age writers. Studies of variability, of disability, of earliest attempts at writing, and of age-level differences in performance may come later.

Arrangements for Videotaping

Each of our four writers came to the university three times a week for a total of twelve one hour and fifteen minute sessions to write in a special laboratory setting (see Figure 1). Sitting alone in a small office at a narrow desk, each writer transcribed his or her composition on a specially-sized, lined pad placed in a tapemarked outline on the desk. Suspended from the ceiling above and just slightly in front of the desk was a video camera focused on the writing pad. From across the room at desktop level was another video camera focused on the writer. The signals from both cameras passed through a special effects generator, which permitted both signals to be recorded simultaneously for play-back on a split screen. The signal from the camera on the writer also passed through a date-time generator which recorded the time in minutes, seconds, and tenth of seconds in a small frame on the videotape (see Figure 2).

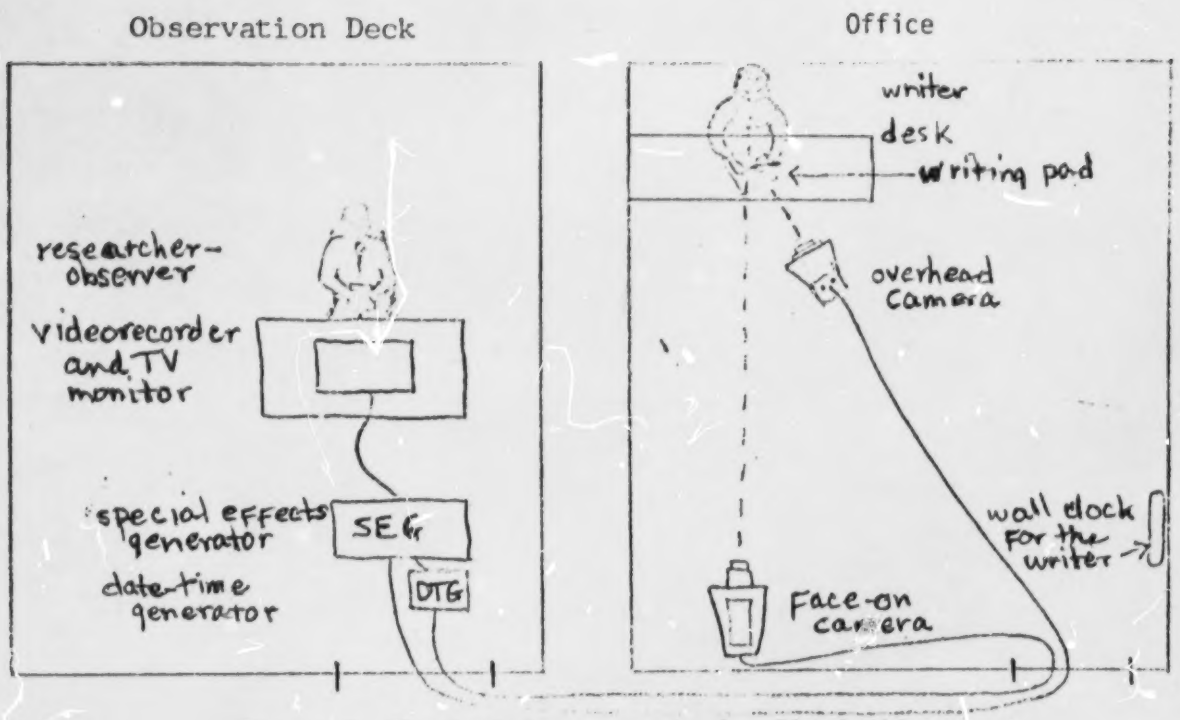


Figure 1: Physical Arrangements for Timed Videotape Studies of Transcribing and Composing

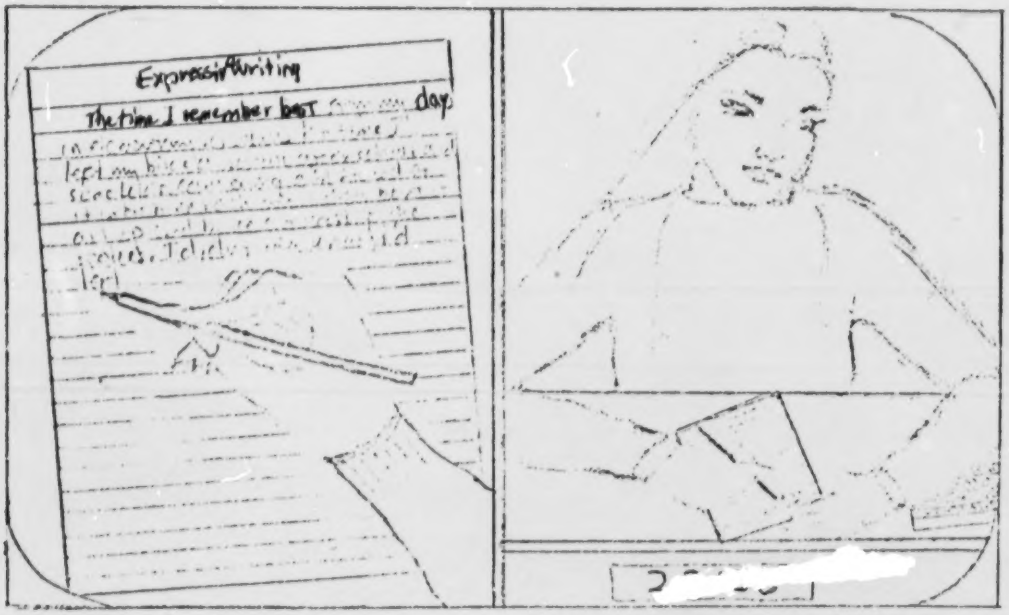


Figure 2: Split Screen Video Replay of a Writer at Work

Drawings by Laura Cooper

In an adjoining observation deck were located the special effects generator, the date-time generator, the video recorder, and the video monitor. Putting this equipment in a separate area removed the inevitable equipment noises and distractions from the writing situation. The researcher-observer (Ann Matsuhashi) monitored each writing session, watching the transcription unfold on one half of the screen and the writer at work on the other half, taking notes to guide a stimulated-recall interview (Della-Piana, 1977) with the writer just after the writing was completed.

Since we used hour-long videotapes, writers had up to one hour for each composition. They had a large wall clock to watch in order to pace themselves. We gave the writer each new writing task at the session prior to the one for writing on that task and encouraged the writer to rehearse and plan without making notes or outlines. The piece of writing produced during the session resembled an early draft rather than a closely-edited, final copy since the writers were working within a time constraint. In addition, the writer was able to choose the writing task from a task pool within each discourse type.

We asked each writer to produce in the laboratory setting two pieces of expressive writing and six pieces of transactional writing (two each of reporting, generalizing, and persuading). The writing tasks were all prose nonfiction. They are the sorts of tasks commonly done in school or college or on the job. The range of discourse types (expressive, reporting, persuading, and generalizing) provides a major context for analyzing the transcribing behaviors we will observe. Our assumption is that these transcribing behaviors will be different for each discourse type. In planning our writing tasks we were guided by the discourse theory of James Moffett (1968) and James Kinneavy (1971) and the scheme for classifying written discourse of James Britton and his colleagues (1975).

Procedures

The first three writing sessions for each writer were for the purpose of familiarizing him or her with the laboratory setting, with the procedures, and with the writing time constraint. In these first three sessions all the equipment was used and we followed all the procedures outlined below, but we did not keep the videotapes of these sessions. The next eight sessions were recorded writing sessions, and the last a recorded copying session (see Table 1).

Beginning at the first session and at each session thereafter, the writer selected from twelve tasks in the appropriate discourse type the task he or she wished to write on at the next session. The writer was encouraged to rehearse and plan but was not permitted to bring notes or outlines to the writing session. By giving the assignment in advance and permitting some choice of task, we were attempting to move one step closer to the actual workings of the composing process: knowing the topic launches the pre-writing phase of composing, permitting gestation and rehearsal. We excluded notes from the sessions because we wanted to time the original first draft transcription of the topic.

Once the writer was seated, the researcher-observer went to the adjoining observation deck, turned on the video-recorder, and signaled to the writer to proceed when ready. The researcher-observer observed the writing and the writer on the split screen, making notes about unusual behaviors or patterns of behavior. Later, after the recorded sessions, with the piece of writing before them, the researcher-observer lead the writer through an audio-recorded stimulated-recall interview, for the purpose of inquiring about noticeable behaviors--long pauses, long spurts of writing, revisions, repetitive behaviors. We assummed that the writers themselves could contribute in a significant way to our inferences about the composing process lying behind the transcribing behaviors.

Table 1: Schedule of Writing Sessions

	Session Number	Writing Task	Purpose of Session
Week 1	1	Expressing	
	2	Generalizing	Familiarization Writing
	3	Persuading	
Week 2	4	Expressing	
	5	Reporting	
	6	Generalizing	Round 1 Writing
	7	Persuading	
Week 3			
	8	Expressing	
	9	Reporting	
Week 4	10	Generalizing	Round II Writing
	11	Persuading	
	12	Copying a Reporting task	Copying

For this present report, we are presenting tentative early findings from our analysis of only one of these four writers.

An Initial, Tentative, Exploration of the Data

Even though we are still searching for ways to analyze the extensive pause time data we've collected, we have proceeded to examine a small portion of the data with a hand calculator in order to see what might emerge. We decided to look at the work of only one of our four writers (John) and, further, to look at only his reporting and generalizing pieces.

This section of the paper will describe an early trial run with some of the data from this study. First, we will explain the procedures we devised in order to obtain the sort of pause time protocol shown in Figure 3. Next, we will report on our initial findings from a description of the temporal rhythm in John's reporting and generalizing pieces. Finally, we will discuss some possible directions for analysis of the larger patterns within each discourse type.

Procedures for Transcribing the Data

When we finished collecting our data, that is, when our four writers had each completed all eight of their pieces, we had a small videotape library of thirty-two, hour-long videotapes. This sort of visual library provides an unusual opportunity for researchers to go back to the original data and to examine it over and over again in new ways. However, for us, it was necessary, first, to translate the tapes into a format more immediately accessible to our research purposes.

Our first task was to obtain a second-by-second record of the temporal duration (the length) of each pause. This proved to be an arduous task. We played the tapes back on the videotape monitor and noted the time displayed on the screen

of the monitor every time the writer ended the word and began the next. In order to be accurate, we watched the tape on slow motion--at between 14 to 6 times slower than actual time. At this slow playback speed, we were able to record accurately each tenth of a second of transcribing time. The next step was to subtract the time when the writer lifted the pen at the end of a word from the time when the writer began the next word. After subtracting we had a worksheet displaying the pause times between words as shown in Figure 3.

We were aware, at the outset, that writers often reverse their direction to revise portions of their work. Consequently, we had to find a way to include in our data the temporal features of these revisions. The notation system displayed in Figure 4 allowed us to keep track of the writer's movement and pause times during revisions. We can see, by looking at the top half of Figure 4, John's handwritten draft, that he deleted the word "other" and substituted the word "first". Because we could not determine exactly when the revision was made, we developed the notation system displayed in the bottom half of Figure 4. Allow us to "walk" you through this example:

The two columns on the right stand for the location and the temporal occurance of the revision, respectively. The circled (5) indicates that this was John's fifth revision. It is located on line 29 of the text, but John did not actually revise until after he had written the word "express" on line 30. Let's follow John's temporal progress through two lines:

1. John wrote " feeling (or whatever), the other"
2. After writing "other", he paused for three tenths of a second (.3) and continued line 29.

Figure 3: Sample Workshop Including Pause Times

John-Generalizing	loc	temp
20 2.5 1.0 .8 .8 1.2 .8 The reason most groups don't work		
21 2.0 1.5 .6 .8 three 6.2 qualities 1.2 1.1 1.5 is that these of a successful		
22 2.5 4.2 2.1 rarely 1.0 39.6 present . First 1.4 , leaders		
23 0.5 4.2 2.1 naturally 29.9 . However 3.1 , their		
24 1.7 1.6 1.3 function as moderators 3.3 1.3 is not .9 usually 1.5 ful-		
25 1.6 filled 1.7 . Either 6.2 the .9 group 1.3 overshadows 1.1 him .7 and		
26 1.6 1.0 he loses .9 control 1.0 over 1.0 them 2.8 , or 8.2 he 2.3 dominates		
27 2.8 1.9 the .9 group completely 4.9 , and 1.2 thus 1.2 defeats 1.0		
28 1.2 .9 .8 purpose 1.0 of 1.0 having a .9 group .7 in the 1.0 first		
29 1.8 place.		

Figure 4: Worksheet Codes for Indicating the Location and Time of Revisions

1. This is the way a single word revision appears in John's handwritten draft.

... feeling (or whatever), the ~~other~~ first person is more likely to express his thoughts on what he...

2. This is the way the same single word revision is represented in our worksheet.

		loc	temp
29	1.3 Feeling .6 (or .8 whatever) 1.0 , .6 the .7 ~~other~~ (5) first (5) .3 person .5 is .7 more express 1.3 ~~other~~ first 1.8 his	29 (5)	30 (5)
30	2.3 likely .5 to 4.5 express his 1.0 thoughts .9 on .5 what 1.2 he 3.4 has (5)	29 (5)	30 (5)

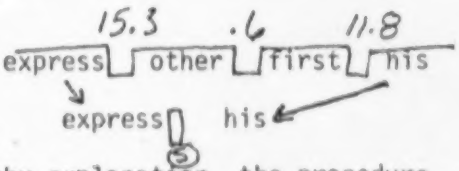
3. Moving to line 30, John wrote "likely to express". He paused for 15.3 seconds, then he deleted "other" in line 29, substituted "first" in line 29 and finally returned to line 30 and wrote "his thoughts on what he has".

In order to denote the above movements in the text we use the following signals:

[~~other~~] ⑤ This word was originally included in the text, but was later deleted during the fifth revision.

[first] ⑤ This word did not originally appear in the text, but was inserted during the fifth revision.

(see below) This rectangle with the number 5 flags the temporal occurance of the revision. The revision is actually charted in the space above the rectangle.



In spite of this lengthy explanation, the procedure, itself, is easy to use and allows us to represent the writer's forward and reverse motion during transcribing.

As a result of this time-consuming job of transcribing video tapes, we were willing to reconsider proposals others had made for obtaining a timed record of a writer at work. We remembered that James Britton (Britton, et.al., 1975) had explored the possibility of using an electronic transmitting pen and recording unit. We have just learned that such a pen has been developed by two British researchers (Crawshaw and Ottoway, 1977). Certainly a paper or magnetic tape

readout would be an invaluable addition to our video tape set-up. We would, however, retain the video tape apparatus for use in research of this kind. Its advantage is that it allows us to describe a larger range of behaviors, including body posture, facial expression, movement of the hand and the pen, as well as re-reading and revising activity.

Describing Temporal Rhythms at Phrase Structure Junctures

After we had finished marking the pause times on John's eight protocols, we leafed through the pages of over 4,000 pauses and asked ourselves how to proceed. We decided to organize the pauses, using simple grouping methods, in order to create a manageable description of the data. We didn't expect to learn a great deal about John's composing process in this first stage, but we did hope that the summary description would suggest where to look next in our search.

From the summary description of the data, we observed differences in the mean pause length for all of John's four discourse pieces. Since the largest mean difference occurred between reporting and generalizing,we decided to explore pauses at phrase structure junctures in these two discourse types.

Summary description. In an attempt to organize John's 4,000 pauses ranging from one tenth of a second (.1) to 95.3 seconds, we compiled frequency distributions of the pause lengths for each of the four discourse types. We found that for all of our four writers, the curves created by the pause length distribution were remarkably similar, markedly skewed to the left and followed by an exceptionally long right rail (see the insert in Figure 5).

Figure 5 displays the curve created by the percent of pauses from one tenth of a second (.1) to 3.5 seconds for all of John's writing. The average median for all four discourse types occurs at one second (1.0). The median

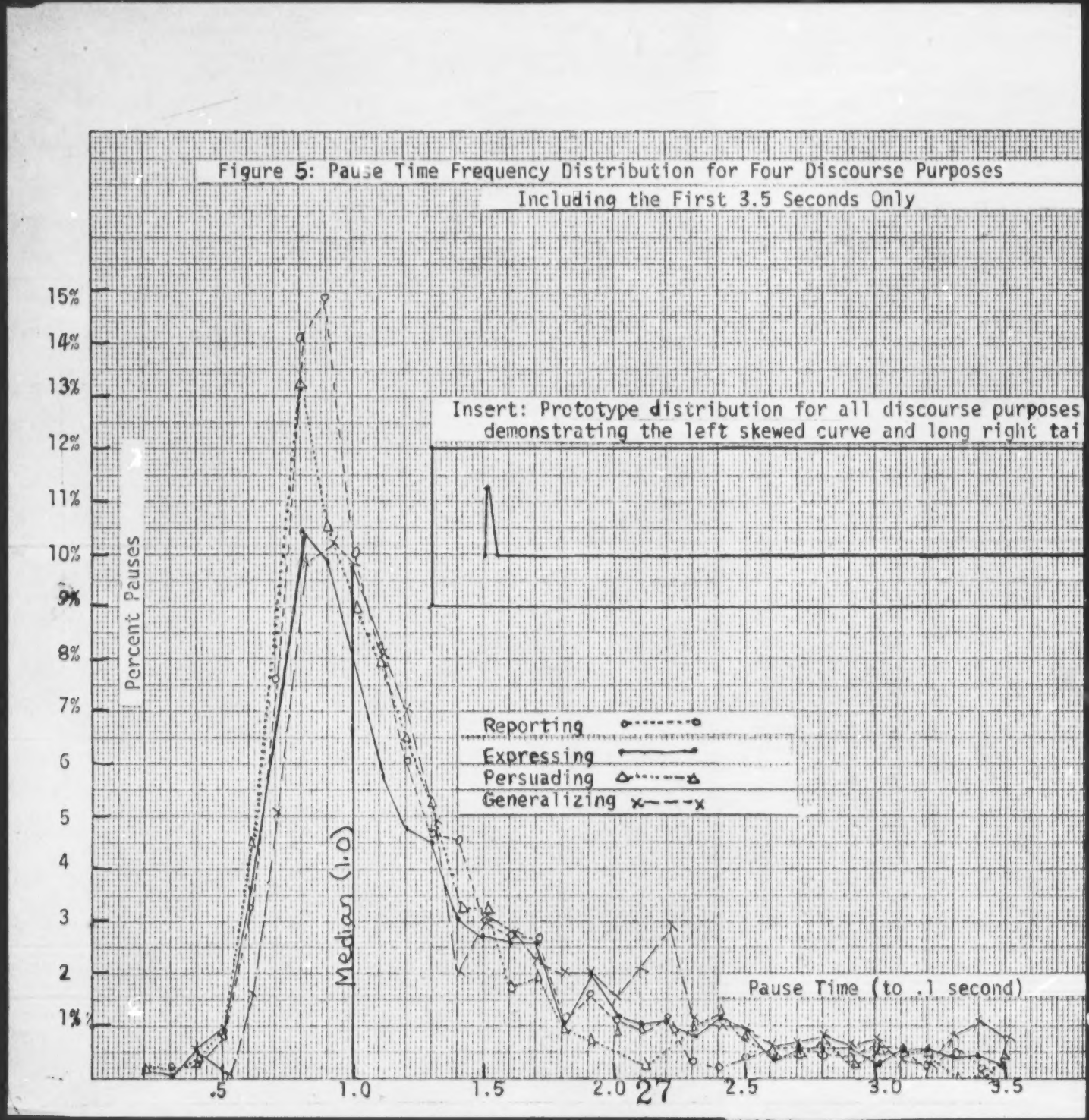


Figure 5: Pause Time Frequency Distribution for Four Discourse Purposes
Including the First 3.5 Seconds Only
Insert: Prototype distribution for all discourse purposes
demonstrating the left skewed curve and long right tai
Percent Pauses
15%
14%
13%
12%
11%
10%
9%
8%
7%
6
5
4
3
2
1%
Median (1.0)
Reporting
Expressing
Persuading
Generalizing
Pause Time (to .1 second)
.5
1.0
1.5
2.0
2.5
3.0
3.5

divides the 50 percent shortest pauses from the 50 percent longest. Pauses shorter than one second seem to occur only in automatic pre-planned sequences of writing. That is, during casual observation, pauses under one second are barely noticeable. They seem to involve only the amount of time necessary for the writer to pick up the pencil at the end of one word and rapidly begin the next word. Therefore, we decided to look closely at the pauses that were longer than one second.

In addition to representing graphically the pause frequency distribution, we charted some of the most obvious summary information (see Table 2). We included a short copying episode in our summary descriptions in order to compare all of John's composing behaviors to a task that required transcribing but no original composing. There are sharp differences between copying times and transcribing times. When copying, John pauses less, writes more words per minute, and spends a larger percentage of his time writing than pausing. Regardless of the activity being performed, copying or transcribing, the mode and the median remain relatively stable. Again, these pauses shorter than one second (1.0), which characterize the median and the mode, might be considered a minimal pause length necessary to transcribing.

The most interesting information from this summary description is the upward trend established by successively higher pause means for reporting, then expressing, then persuading and finally generalizing. When John composes for the purpose of generalizing, he pauses for longer periods of time, writes fewer words per minute, and spends a larger percentage of his time pausing than transcribing.

These findings might seem obvious and yet they are the first empirical evidence we know about demonstrating that composing times differ in systematic ways for different discourse or modal types. Generalizing's mean pause length

Table 2: John--Transcribing Rhythm Summary Description (to .1 second)

	Copying	Reporting	Expressing	Persuading	Generalizing
Mean Pause Length	.87	1.76	2.04	2.12	2.70
Words per minute	22.19	14.90	13.03	13.15	11.00
	-32	-7	0	-4	+6
% Pause Time	34%	47%	50%	48%	53%
% Transcribing	66%	54%	50%	52%	47%
Mode	.5	.8	.7	.7	.8
Median	.7	.9	1.0	1.0	1.1

is half again as long as reporting's mean pause length. If pauses longer than one second represent planning, then planning is a more time-consuming process--and perhaps a more complex process--for generalizing than for reporting. These findings provide direct empirical support for an important claim in current discourse theory: a writer thinks and plans in different ways for different kinds of writing (Kinneavy, 1967). Obviously, the next step is to examine the contexts of pauses in reporting and then in generalizing in order to see where the extra pause time is being expended in generalizing.

Pauses at phrase structure junctures for John's reporting and generalizing. Even though we are optimistic about eventually being able to characterize a mental reality for temporal aspects of composing in writing, it would be premature of us to assert that the initial findings presented here allow us to do so.

In order to characterize a temporal rhythm for John's reporting and generalizing, we have chosen only one direction from many possibilities. We have chosen to examine the location and duration of pauses at phrase structure junctures. We employed a syntactic analysis system developed by Cynthia Courts for her dissertation study at the State University of New York at Buffalo. Our procedure was to mark the syntactic analysis directly onto our timed worksheets. It was then a simple task to go back through the pieces of writing and examine the pause times at the transition points prior to marked features.

Since we only wanted to look at pauses longer than one second (1.0), we found it necessary to divide our pauses into two new categories. From this point on, we will speak of fluent and hesitant pauses. Fluent pauses range from one tenth of a second (.1) to nine-tenths of a second (.9). Any pause one second or longer will be called a hesitant pause. This new pause distinction changed some of our tallying methods. Since we are now interested in hesitant pauses you will begin seeing the term "hesitant pause means". This refers to the average of only the

hesitant pauses, pauses one second or longer.

We have divided our phrase structure analysis into three levels: the T-unit, the clause, and the phrase. Kellogg Hunt's research (Hunt, 1965) has indicated that the T-unit, an independent clause with all its attached modifiers, and not the sentence, should be the basis for intrasentential analysis. At the T-unit level we examined pause transitions prior to all T-units, and then prior to T-units introducing paragraphs, left branching, T-units beginning with free modifiers, and then at T-units occuring within compound sentences. At the clause level, we examined the pause transitions prior to all subordinate clauses, and then separately before the noun clauses, adjective clauses, and adverb clauses. At the phrase level, we looked at four categories of phrase transitions: adverbial phrases of time, verbal phrases, nominal phrases, and adjective phrases.

We sorted and arranged the data in two ways. First, we calculated the hesitant pause means for each category of pause transition listed above (see Table 3). The hesitant pause means listed in Table 3 can be summarized as follows:

1. Hesitant pause means are longest before T-units, shorter before subordinate clauses, and shortest before phrases.
2. Even though, for both generalizing and reporting, the highest hesitant pause means are at the T-unit level, the T-unit hesitant pause means for reporting are much lower than the T-unit means for generalizing.
3. For reporting, the longest hesitant pause means are before T-units in all locations, noun clauses, and adverbial phrases.
4. For generalizing, the largest hesitant pause means are before T-units in all locations and adjectival phrases.

Table 3: Hesitant Pause Means for Reporting and Generalizing

	DISCOURSE PURPOSES	
	Reporting	Generalizing
Discourse Mean	2.84 (663)*	3.89 (482)
Pre T-unit	4.00 (69)	13.51 (46)
Paragraph	9.30 (9)	20.96 (9)
Within Sentence T-Unit	3.09 (15)	6.91 (10)
Initial Free Modifier	8.46 (14)	14.33 (15)
All Clauses	2.92 (31)	2.50 (19)
Noun Clause	3.57 (7)	2.16 (8)
Adjective Clause	2.52 (13)	2.74 (5)
Adverb Clause	2.99 (11)	2.75 (6)
All Phrases	2.65(104)	3.25 (75)
Adjective Phrase	2.11 (61)	4.29 (36)
Nominal Phrase	2.50 (12)	2.23 (13)
Verbal Phrase	2.34 (18)	2.40 (17)
Adverb Phrase of Time	5.74 (13)	2.12 (9)

* number of pauses

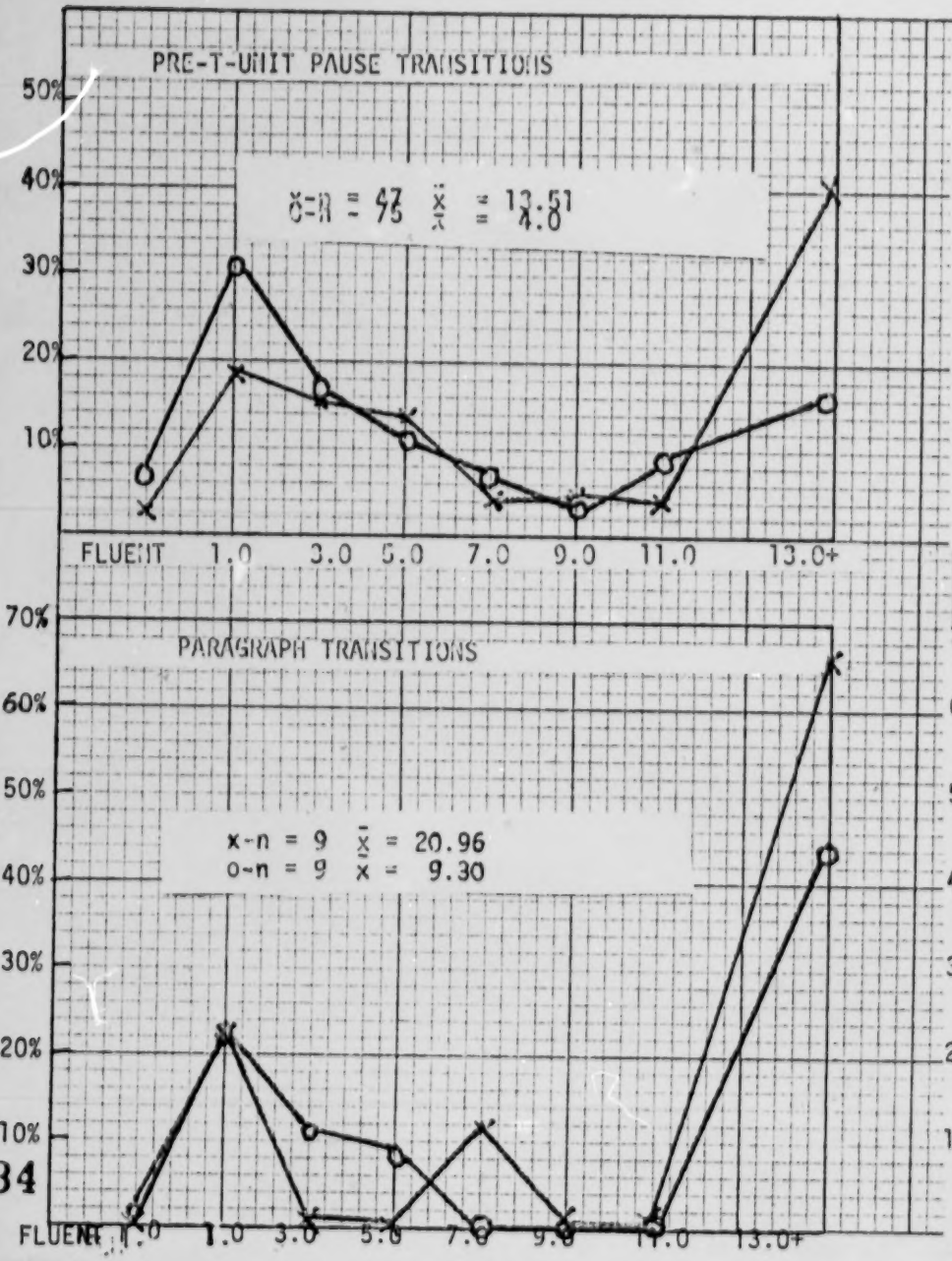
From this four point summary of hesitant pause means we begin to see differences emerge between reporting and generalizing. However, because the mean is easily altered by single, long pauses, we will avoid drawing conclusions from hesitant pause means alone. Instead, we will pursue our questions on the basis of a graphic description of the data as well as on the basis of hesitant pause means.

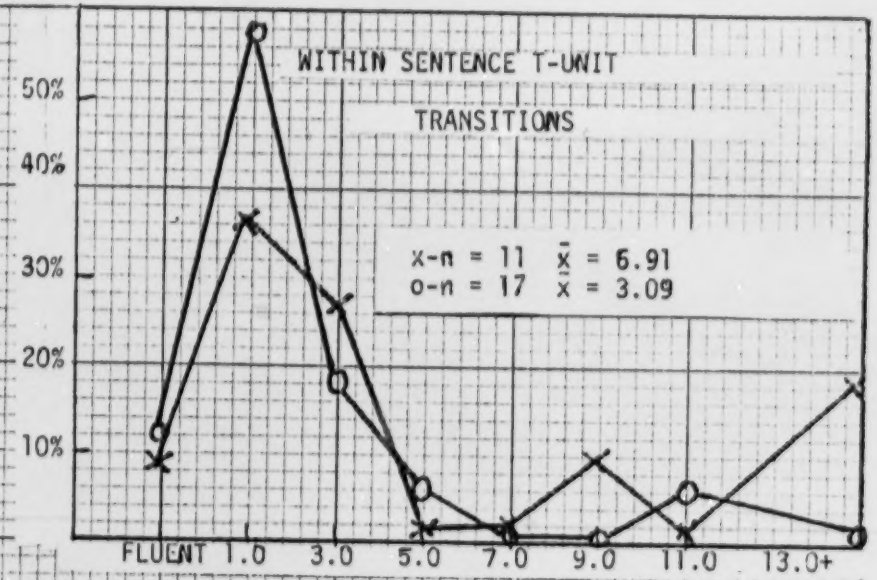
In order to learn more about how John composes in reporting and generalizing we initiated our second, more detailed, graphic representation of each of the pause transition categories. For each pause transition category, we sorted the pauses into eight intervals ranging from fluent pauses to pauses longer than thirteen seconds. Next, we established the percent of pauses in each interval. Finally, in order to compare John's reporting and generalizing, we graphed the percent frequency distribution for both reporting and generalizing onto one graph. We followed the same procedure to graph each category of T-unit, clause, and phrase.

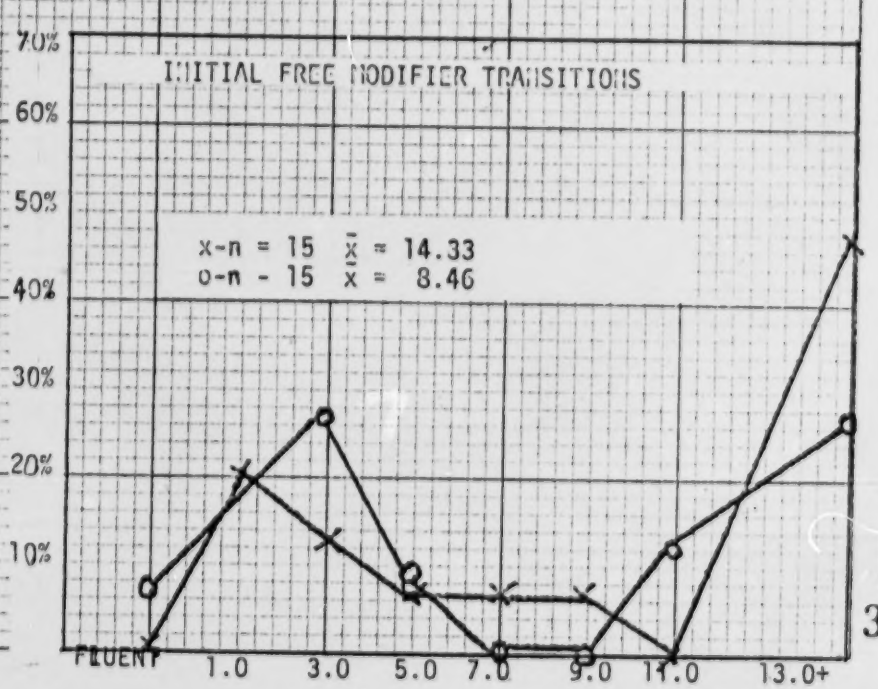
The T-unit (Figure 6): At the T-unit level for both reporting and generalizing for all T-unit transitions, paragraph transitions, and initial free modifier transitions a distinct pattern emerges. (Because within-sentence T-unit transitions are an exception to this pattern, we will discuss them below.) The three T-unit categories are characterized by a very low percentage of fluent pauses and a large percentage of hesitant pauses over thirteen seconds. Even though the percentage pause distributions display similar patterns for both reporting and generalizing, the hesitant pause means for generalizing are substantially higher than the means for reporting.

The T-unit category called 'within sentence T-unit transitions' refers to places in the text where John had written more than one T-unit within the conventional boundaries of the sentence. Goldman-Eisler refers to these T-units as coordinate clauses. For this category, in both reporting and generalizing, there is

Figure 6
JOHN--PERCENTAGE TRANSITIONS BETWEEN REPORTING —o— AND GENERALIZING —X— (T-UNITS) WITH HESITANT PAUSE MEANS







a very high percentage of relatively short hesitant pauses between one and three seconds long. In generalizing, 18 percent of the within sentence T-unit pause transitions are longer than 13 seconds, while in reporting there are none. Throughout reporting and generalizing, John uses conventional coordinators such as and, but, yet, or, and nor. But in generalizing, John also uses the colon and dash to connect T-units. For example,

Reporting: After the interview, my dad left 1.2 and I took a couple of brief placement tests.

Generalizing: It is my feeling that this occurs because of a basic self-centeredness: 22.1 people tend to be too interested in their own lives to bother exposing themselves to how others live.

In reporting, John pauses briefly (1.2 seconds) before coordinating the sequence of actions that he is narrating. In generalizing, however, John pauses for 22.1 seconds, presumably to plan for the second T-unit, which offers a more specific definition of self-centeredness. Certainly, the relationship between the two generalizing T-units is a more complex one than the relationship between the two reporting T-units. In John's generalizing the long pauses before this more complex type of coordination reaffirms our basic hypothesis--more complex planning activities are evidenced by longer pause transitions.

The difference between reporting and generalizing at the T-unit level is highlighted in the difference between the hesitant pause means at paragraph transitions--11.66 seconds. As John reports the chronologic nature of a specific event, he proceeds from T-unit to T-unit. A careful reading of his reporting pieces indicates that, at paragraph junctures, he ends one section of the chronology and begins a new section. By contrast as John composes paragraph juncture T-units for generalizing, he seems to be engaging in a very different kind of activity from composing paragraph juncture T-units for reporting. He uses the paragraph juncture T-units in generalizing to create an organizational pattern for the

entire paragraph ("a number of reasons"). Even though we discuss this topic more thoroughly in the next section on large patterns in the data, we might tentatively conclude that the high hesitant pause mean for generalizing represents planning for an entire sequence of T-units. The lower hesitant pause mean for reporting might reflect planning only for individual T-units.

The clause (Figure 7): At the clause level for both reporting and generalizing in all four clause transition categories a pattern emerges. There are a high percentage of fluent pauses, a high percentage of short (1-3 seconds) hesitant pauses and almost no long, hesitant pauses. It is interesting that the hesitant pause means for both reporting and generalizing are now nearly equal--all are between 2.16 seconds and 3.57 seconds--but the difference between hesitant pause means at the clause and T-unit level for generalizing is much larger than the difference between hesitant pause means at the clause and T-unit level for reporting. We might conjecture that planning time is distributed more evenly at all levels throughout reporting than it is throughout generalizing. As we have already pointed out for generalizing, planning time seems to be concentrated at the T-unit level.

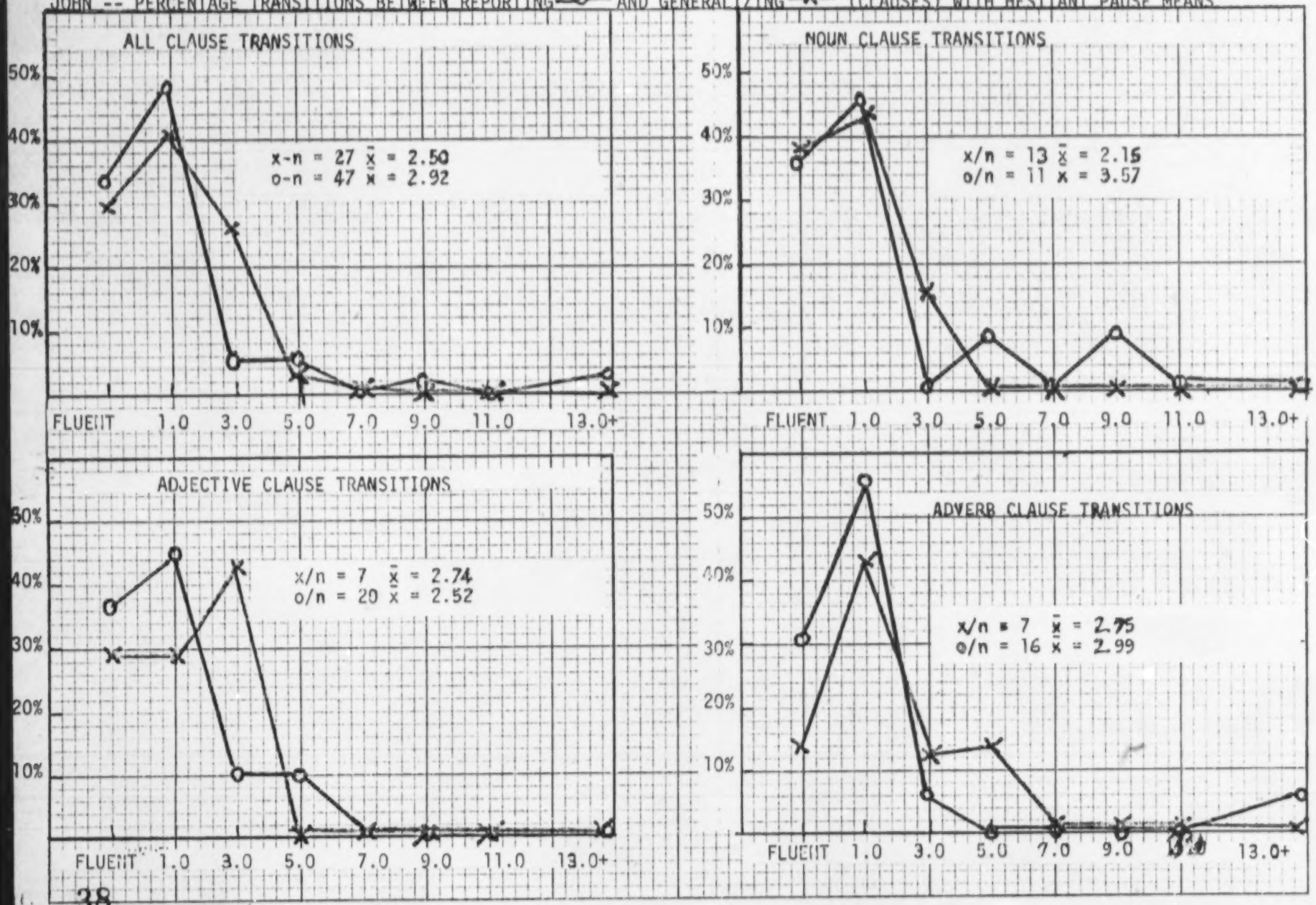
At the clause level, we can distinguish between reporting and generalizing by examining the highest hesitant pause means for the clause category. Reporting has the highest hesitant pause mean for noun clause transitions and generalizing has the highest hesitant pause means for adverb clause transitions.

The noun clauses, within the context of John's reporting, articulate a particular assertion in the chronology of the piece.
For example,

> (The kid told me) that he was just about to pass on a friendly work of advice.

Figure 7:

JOHN -- PERCENTAGE TRANSITIONS BETWEEN REPORTING —o— AND GENERALIZING —x— (CLAUSES) WITH HESITANT PAUSE MEANS


ALL CLAUSE TRANSITIONS
x-n = 27 x̄ = 2.50
o-n = 47 x̄ = 2.92
NOUN CLAUSE TRANSITIONS
x/n = 13 x̄ = 2.15
o/n = 11 x̄ = 3.57
ADJECTIVE CLAUSE TRANSITIONS
x/n = 7 x̄ = 2.74
o/n = 20 x̄ = 2.52
ADVERB CLAUSE TRANSITIONS
x/n = 7 x̄ = 2.75
o/n = 16 x̄ = 2.99
50%
40%
30%
20%
10%
FLUENT 1.0 3.0 5.0 7.0 9.0 11.0 13.0+

(I would have explained) that I was new to the school that day.

The adverb clauses, within the context of John's generalizing pieces, specify a condition or a reason for the assertion in the main clause.

For example,

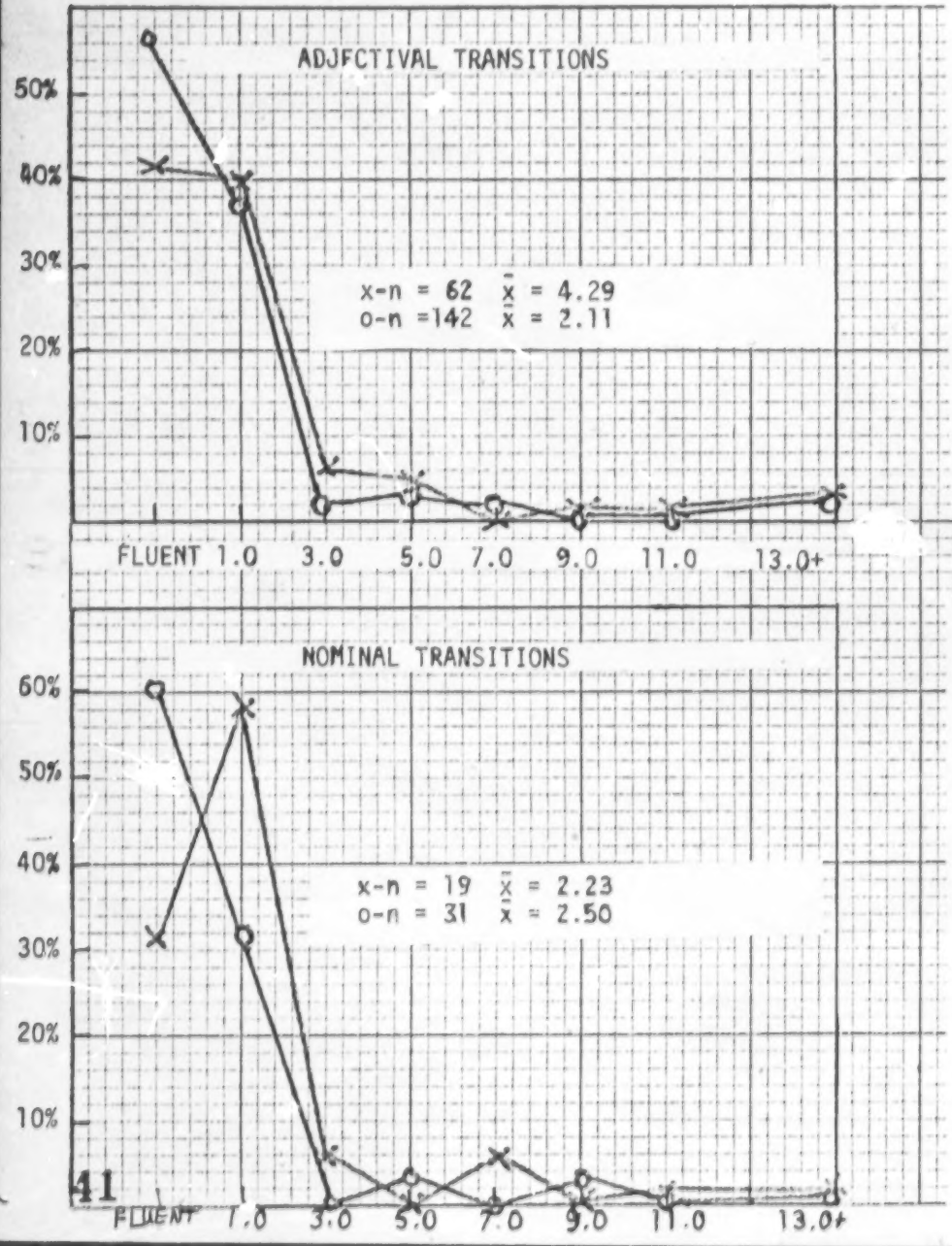
(It is impossible to have any communication at all) if information is being transmitted by all and received by none.

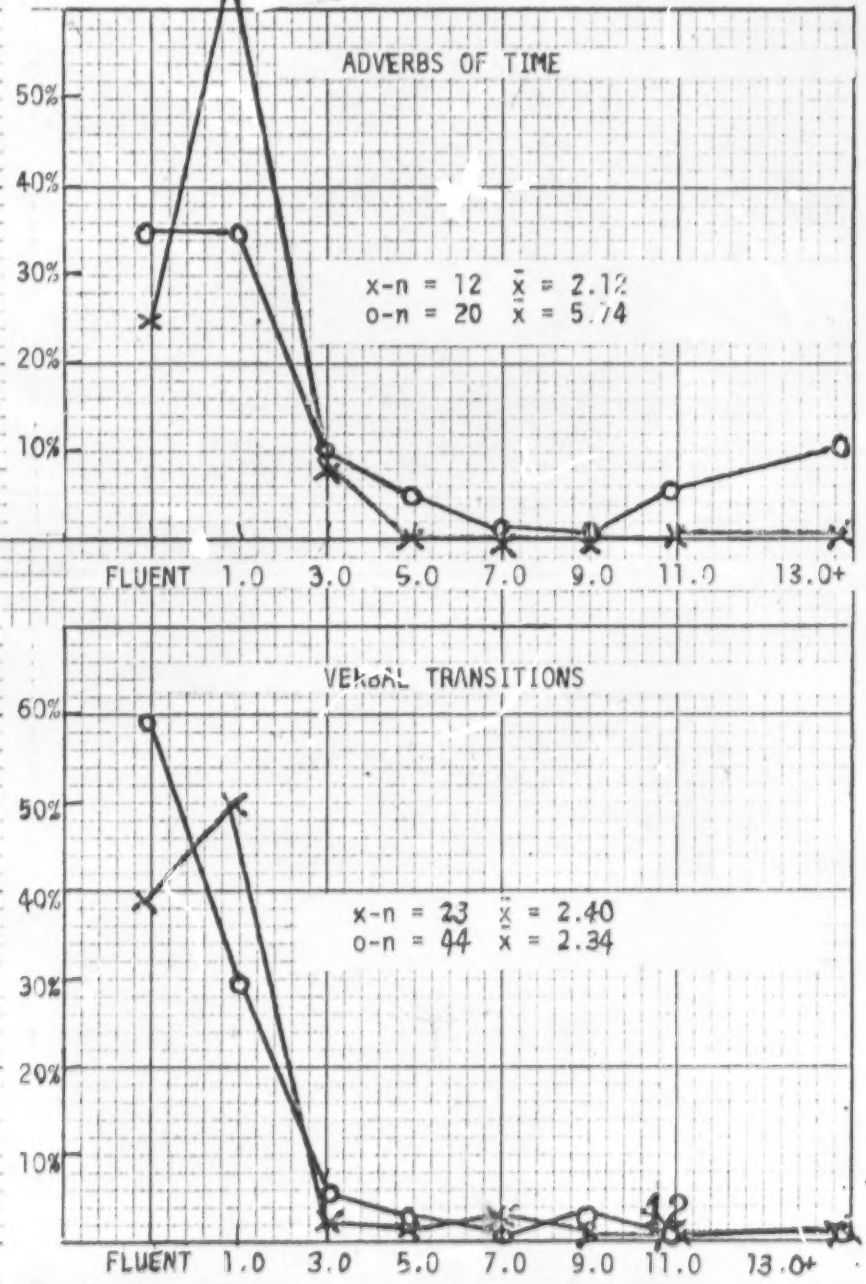
(This will not work in a group) because a group must be able to function as a unit.

The fact that John spends more time pausing before transcribing different clausal structures for reporting and generalizing, in addition to the fact that these clausal structures contribute to reporting and generalizing in different ways, provides further evidence that planning differs for each discourse type in different temporal patterns of transcribing and composing in reporting and generalizing.

The phrase (Figure 8): For both reporting and generalizing, at the phrase level, there are a very high percent of fluent pauses, a high percentage of short hesitant pauses, and, again, a very small percentage of long hesitant pauses. Reporting has the highest hesitation pause means for adverbial phrases of time transitions. Throughout reporting, John pauses prior to phrases such as these: soon, back during my junior year, still planning, an hour away, and the day before. The mean hesitant pause length (5.74 seconds) is higher than the mean for any other reporting category at the phrase and clause level and even higher than some categories at the T-unit level. Adverbial phrases of time transitions demonstrate that John is using pauses prior to these constructions to plan for the chronological sequence of events necessary to produce a piece of reporting. By contrast, generalizing has the highest hesitant pause mean for

Figure 8:
JOHN -- PERCENTAGE TRANSITIONS BETWEEN REPORTING —o— AND GENERALIZING —x— (PHRASES) WITH HESITANT PAUSE MEANS





adjectival phrase transitions. John uses adjectival words and phrases like these: other's health, eventual opportunity, genuine interest, real group effort, three qualities of a successful group. These adjectives help John to clarify the noun being modified as well as to sharpen the focus of the generalization he is supporting. However, for generalizing, pauses at adjectival phrase transitions do not contribute nearly as heavily to the temporal character of generalizing as adverbial phrases of time transitions contribute to the temporal character of reporting.

By comparing the relative duration of pauses at phrase structure junctures, we have been able to sketch a temporal pattern for John's transcribing activity when composing reporting and generalizing. One of our basic assumptions is that pauses of relatively long duration indicate planning activity. If this is so, then John's temporal transcription pattern for generalizing indicates consistently longer pauses, more planning time, and a more complex composing task.

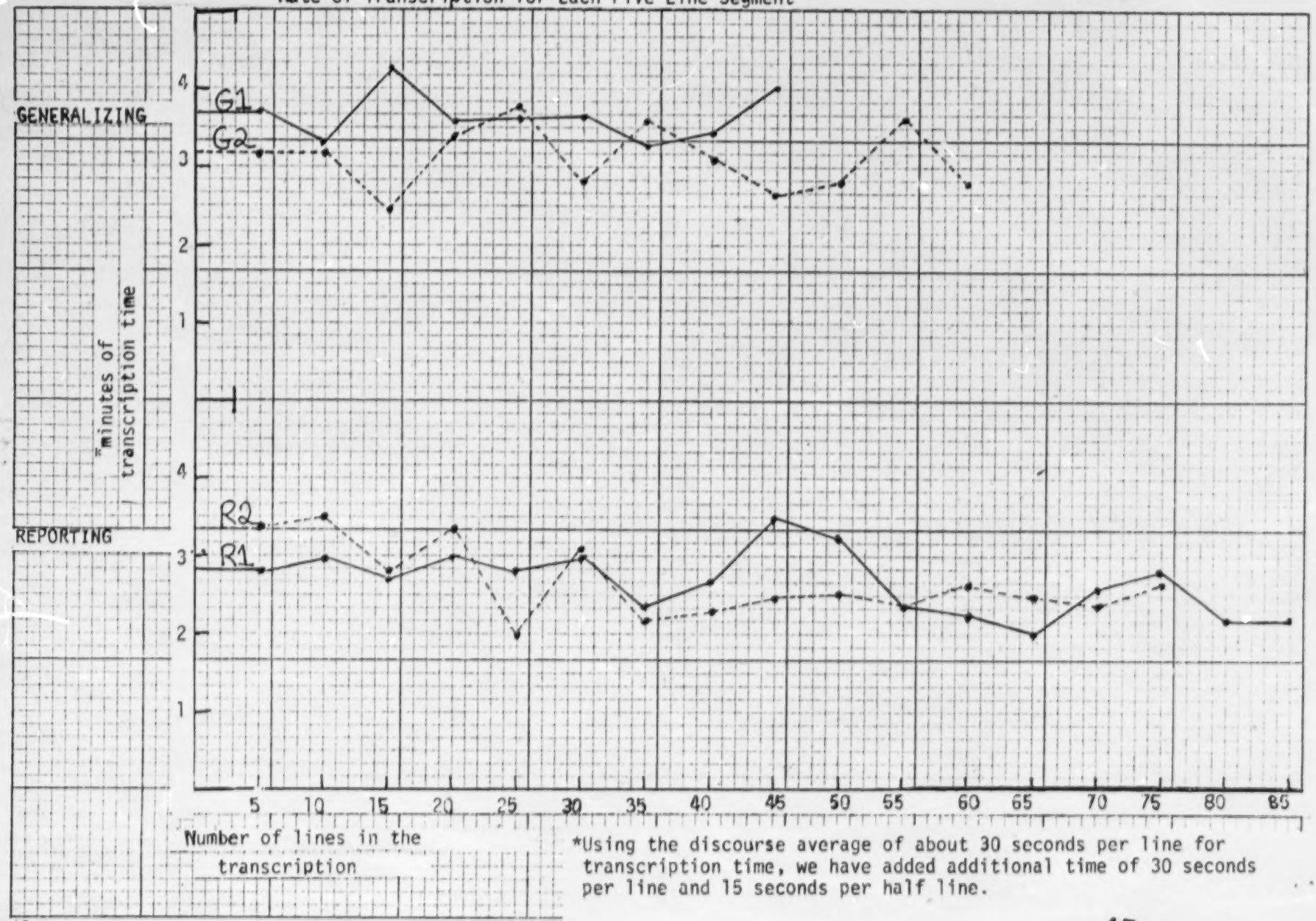
In the next section, we will look at temporal patterns throughout entire pieces of discourse, rather than at phrase structure junctures.

Large Temporal Patterns in the Data

One way of looking for large temporal patterns in our data is to graph the rate of transcription for each five line segment in a whole piece of discourse. If planning requirements are more demanding at certain points in the discourse, we would expect to find a rising line on the graph. If planning requirements are relatively manageable, we would expect to find a straight or declining line on the graph.

From discourse theory we would anticipate few if any periods of planning in the narration of a single incident like our reportage task and several periods of planning in generalization as each new theme or generalization is introduced. Figure 9 reveals that our data confirm these anticipations.

Figure 9: Composing Rhythms for Generalizing and Reporting--
Rate of Transcription for Each Five Line Segment



*Using the discourse average of about 30 seconds per line for transcription time, we have added additional time of 30 seconds per line and 15 seconds per half line.

Generalizing is characterized by periods of slow-going inference at a high level of abstraction followed by faster-moving illustrations or incidents. For G1, if we overlook some aimless restatement of the main generalization between Lines 5 and 10, there is a slow period of presenting the main generalization and finding a direction for the paper (Lines 1-15), followed by a faster and steadier period of illustrating the theme, though still not at a very low level of abstraction (Lines 20-40), and finally another slow period of reaching a conclusion by offering a solution to the problem posed by the main generalization. For G2, there is a steady opening (Lines 1-10) where the main generalization and an abstract organizer ("a number of factors") are presented, followed by a brief but quick series of illustrations; and then we see the slow climb to another organizing generalization ("these three qualities"). After the first part of this new generalization is quickly illustrated (Lines 25-30), we slow down again for the statement of the second part of the new generalization and then speed along through another series of illustrations (Lines 35-45), only to slow again finally before the concluding section, which, like G1, proposes a high-inference theoretical solution to the problem posed in the main and secondary generalizations.

How does the composing rhythm differ in reporting? The first thing to note about the difference between generalizing and reporting in Figure 9 is that in reporting the writer rarely (only once in a notable way in both pieces, Lines 45-50 in R1) spends more time on any five line segment than he spends on the first five lines, whereas in generalizing he regularly does that (twice in G1, three times in G2). We might say that in reporting it's all down hill from the beginning. The only anomolies are three rapidly transcribed T-units of apparently well-rehearsed self-reference in R2 (Lines 20-25) and several time-consuming sentences of non-narrative explanation in R1 (Lines 35-50). The only other

noticeable slow-down occurs also in R1 (Lines 65-75), again an instance of explanation embedded in narrative reportage.

We can summarize by saying that generalizing requires time-consuming periodic planning. Choosing and stating a high-level inference is a complex cognitive activity. Such an inference and its related sub-inferences require a conception of the piece of writing and a logic in working it out quite different from the conception and plan for reporting--analogic vs. chronologic, to use Moffett's distinctions. Reporting requires relatively little planning time, with what time that is required spread evenly across the whole transcription. Generalizing goes erratically ahead piece by piece. Reporting goes evenly ahead all in one piece.

Again, our data contain no surprises for discourse theorists or practicing writers or even for thirteen year olds who have just left the haven of narrative to try idea writing. Our data do, however, provide empirical support, the first we know of, for the notion that because generalizing and reporting require different logics, they will have different temporal rhythms of composition.

Still another way to look for large temporal rhythms in our data is to see whether there are any temporal rhythms apparent at crucial junctures in a discourse analysis. Because of a recent flurry of interest in discourse analysis among linguists and cognitive psychologists, there are several analysis schemes to choose among, to add to the few already available from rhetoricians. We have worked with two schemes, both still unpublished, developed by researchers at Stanford.

Sarah Freedman and Ellen Nold have developed a useful scheme which permits an efficient analysis of the abstraction level of each T-unit in a discourse (Freedman and Nold, 1978). It has four levels ranging from high level inferences (Level 1) to facts (Level 4) or, put another way, from thesis statements

and organizers to supporting points. After identifying the abstraction level of each T-unit in John's reporting and generalizing, we calculated the means and standard deviations of the pause times before T-units where the abstraction level shifted up from the previous T-unit and before those where it shifted down. Our hypothesis was that a shift up in abstraction level would require more planning time. This hypothesis was confirmed for generalizing but, to our surprise, disconfirmed in reporting (figures are in seconds):

	Upshift		Downshift	
	mean	SD	mean	SD
Generalizing	23.88 (n=9)	18.66	9.31 (n=8)	10.18
Reporting	5.53 (n=11)	4.45	10.56 (n=12)	7.79

The upshifts in generalizing occurred only at paragraph junctures, but in reporting they never occurred there, occurring rather at various points within paragraphs. We might tentatively conjecture, then, that high-level inferences in generalizing mark off the main divisions of the discourse and require considerable planning (a conjecture supported by our findings above based on time to complete successive five line segments), whereas in reporting, shifts upward in abstraction level to make a generalization or a comment "fall out" quite easily from the on-going narrative and require no planning time. In reporting, two of the three shifts to Level 2 did come at the end of paragraphs. It may be that in reporting, planning time is required to pick up the specific details of the narrative thread after one of those occasional higher-inference comments, and, in fact, two of the longest pauses before downshifts occurred at just these junctures. While not in any way definitive, this brief discussion based on abstraction levels suggests some of the intriguing possibilities of our data and points us towards a more thorough analysis of all the writing in our study.

Another Stanford researcher, Brent Davis, has worked out a three dimensional model of discourse that permits plotting of coordinate, subordinate, and superordinate relationships among T-units (Davis 1978). We plotted these relationships in John's generalizing only and discovered that in every case where he made a shift from a subordinate or coordinate T-unit back to a superordinate T-unit, a relatively large amount of planning time was required: mean pause length 24.83 seconds (n=10; SD=15.55). We should point out that this is on average more planning time than is required at paragraph junctures (20.96 seconds) in generalizing. The findings from Davis' scheme support those from the Freedman and Nold scheme.

Next Steps in Analyzing the Data

We are satisfied that our syntactic analysis--on which we have based our tentative conclusions in this report about pauses before T-units, clauses, and phrases--is sound and comprehensive. Our next step is to choose a procedure that will let us study a writer's planning requirements for achieving cohesion in discourse and for working out the structural and functional relationships among T-units in a discourse. We have illustrated some possibilities in the previous section and will mention still other possibilities below.

Very soon we want to work out a comprehensive coding system for each hesitant pause in our data so that a computer can relieve us of the tedium of the one-finger hand calculator. Such a coding system will need to indicate for each hesitant pause every role it plays in the sentence and in the whole discourse.

As a beginning we are trying to extend our discourse analysis to discover in what ways various schemes of analysis can be explained by temporal planning patterns. In a sense we will be testing these schemes to see whether they have any psychological reality, at least so far as that can be revealed by pause data.

Good candidates are Willis Pitkin's procedure for identifying operational hierarchies, a procedure which catalogs "a basic set of binary relationships (functional, not structural) that flesh out the operational hierarchies we call coherent discourse" (Pitkin, 1977, p. 660) and Ross Winterowd's grammar of coherence, a means of classifying the structural relationships among T-units in a paragraph or unit of discourse (Winterowd, 1975).

A very promising approach to our data, we believe, will be to find out whether certain devices for achieving cohesion require more planning time than others. The important recent book Cohesion in English by M.A.K. Halliday and Ruqaiya Hasan will guide our work here (Halliday and Hasan, 1976). They explore in detail five types of cohesive ties: reference, substitution, ellipsis, conjunction, and lexical cohesion. Arguing that a text is a semantic unit, not a structural unit analogous to a sentence, they claim we can only study its crucial text forming features by looking at cohesive ties among sentences. Their book immediately suggests to us several hypotheses, all based on our psycholinguistic assumption that hesitant pauses in writing are for planning, and on the further assumption that achieving cohesion requires planning time:

1. Pauses will be longer at the beginning of a cohesive chain.
2. Pauses will be longer before cataphora than before anaphora. (cataphora is forward-referring, anaphora backward-referring).
3. Subject position nominal groups containing reference will be preceded by longer pauses than similar groups without reference.
4. Among the types of reiteration contributing to lexical cohesion in a text, pauses will be longer before general words and superordinate words than before same words and synonyms/near synonyms.
5. Pauses will be longer before nouns and verbs contributing to lexical cohesion than before nouns and verbs making no such contribution.

6. Among the types of conjunction providing cohesive ties within a text, pauses will be longer before adversative and causal than before additive and temporal.

We will no doubt find confirmation for some of these hypotheses in all the discourse types produced by our writers, but confirmation of others only in certain discourse types.

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